

Claims

1. An oscillating sprinkler transmission having an output gear, said output gear having an axis, a gear cage with two drive gears, a first drive gear and a second drive gear for alternate driving engagement with said output gear to oscillate it, said gear cage having an idler gear in engagement with said first drive gear, said second drive gear and said idler gear being spaced apart, an input gear located between said second drive gear and said idler gear, said gear cage being mounted for pivotal movement around the axis of said output gear, means for pivoting said gear cage to bring one of said second drive gear and said idler gear into engagement with said input gear to drive said output gear in either direction wherein the driving reaction force on the gear cage holds the gear cage in driving engagement with the input gear in either driving direction.

2. An oscillating sprinkler transmission as set forth in Claim 1 having a biasing means applied directly to said gear cage to place said gear cage in driving engagement until the moment of pivotal movement to bring the other of said driving gears into reversed driving engagement.

3. An oscillating sprinkler transmission as set forth in Claim 1 wherein said means for pivoting said gear cage has a toggle device mounted adjacent said gear cage for reversing its movement, said gear cage and
5 toggle device being mounted for separate pivotal movement around the same axis.
4. An oscillating sprinkler transmission as set forth in Claim 3 having a base member with an upstanding fixed center member, said gear cage and toggle device being
5 mounted for separate pivotal movement on said upstanding fixed center member.
5. An oscillating sprinkler transmission as set forth in Claim 1 including an input shaft, said input gear being
5 mounted on said input shaft, a sleeve around said input shaft, said gear cage having stop means thereon, said gear cage stop means being positioned to engage said sleeve
5 to limit engagement of said second gear or idler gear with said input gear.

6. An oscillating sprinkler transmission as set forth in Claim 4 wherein said toggle device has overcenter spring means for biasing said toggle device in one direction on one side of center and in the other direction on the other side of center, said spring means being located between said fixed center member and said toggle device acting outwardly on said toggle device.

7. An oscillating sprinkler transmission as set forth in Claim 4 wherein said gear cage has a bottom plate, said toggle device comprising a toggle plate between said bottom plate and base member, said bottom plate and toggle plate each having a coaxial center opening fitting over the upstanding fixed center member, said toggle device having overcenter spring means for biasing said toggle plate in a clockwise direction on one side of center and a counter-clockwise direction on the other side of center, said toggle plate having a cut-out portion extending from its center opening to a point radially outward therefrom, said spring means being located in said cut-out portion extending between said fixed center member and said point of said toggle plate for acting outwardly on said toggle plate.

8. An oscillating sprinkler transmission having an output gear, means for mounting said output gear for rotation about an axis, a gear cage with a first drive gear and a second drive gear for alternate driving engagement with said output gear to oscillate it, means pivotally mounting said gear cage for movement, means for alternately pivoting said gear cage in one direction to drive said first drive gear and said output gear and in the other direction to drive said second drive gear and said output gear including first spring means for directly biasing said gear cage in one of said directions and then in the other direction, said means for alternately pivoting said gear cage having a toggle device pivotally mounted with respect to said gear cage for reversing the movement of said gear cage, said gear cage and toggle device being mounted for separate pivotal movement, said toggle device being pivotally mounted around the axis of said output gear, second spring means for biasing said toggle device in either direction, said second spring means having fixed spring seat means located radially inwardly of said toggle device, said toggle device having spring seat means located radially outwardly on said toggle device, said second spring means acting outwardly on said toggle device to achieve reversing movement of said gear cage.

9. An oscillating sprinkler transmission as set forth in Claim 8 wherein said second spring means is located in a cut-out portion of said toggle device.

10. An oscillating sprinkler transmission having an output gear, a gear cage for alternate placing of one or the other of two rotating first and second drive gears into driving engagement with said output gear to oscillate it, said output gear and gear cage having a common center, means mounting said gear cage for movement, means for alternately moving said gear cage in one direction to drivingly connect said first drive gear with said output gear and in the other direction to drivingly connect said second drive gear with said output gear, including first means for biasing said gear cage in one direction and then the other direction, and second means for biasing said gear cage in one direction to maintain said first drive gear in driving engagement when said first means for biasing has been removed.

11. A combination as set forth in Claim 10 wherein said second means is also for biasing said gear cage in the other direction to maintain said second drive gear in driving engagement when said first means for biasing has been removed.

12. A combination as set forth in Claim 10 including said second means biasing said gear cage in one direction for a predetermined portion of the movement of said first biasing means from said gear cage.

13. A combination as set forth in Claim 10 including a downward projection on said gear cage having a surface on which said second biasing means acts, said surface being contoured to vary the effect of the second biasing means.

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14. A combination as set forth in Claim 10 wherein said gear cage is mounted for an angular movement between driving engagement of said first drive gear and said second drive gear, said first biasing means biasing said gear cage in one direction for one portion of said angular movement and biasing said gear cage in the other direction for another portion of said angular movement, means for removing the biasing of said first biasing means from said gear cage in one direction for reversing movement of said output gear, said second means for biasing said gear cage in one direction maintaining said gear cage biased in said one direction at least until said first biasing means is biasing said gear cage in said other direction.

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15. An oscillating sprinkler unit, comprising: a
sprinkler head mounted for rotation about a first axis;
drive means comprising a gear carrier with alternately
operable terminal drive means on said carrier; said gear
5 carrier being shiftable about said first axis to alter-
nately engageable driving positions for driving said
sprinkler head in alternate directions; shifting arm
means movable by arc control contact means rotatable with
said nozzle for shifting said gear carrier between said
10 alternate engageable positions; biasing means continuously
acting on said gear carrier for retaining said gear carrier
in a selected one of said alternate engageable positions
until shifted from either position by said shifting arm
means.

16. An oscillating sprinkler transmission as set forth
in Claim 2 wherein said means for pivoting said gear cage
includes an actuation means having spring means, said
spring means being loaded by a cooperating angular limit
5 contact means rotatable with said output gear to pivot
said gear cage to its alternate driving position against
the bias of said biasing means.

17. An oscillating sprinkler transmission as set forth
in Claim 2 wherein said gear cage biasing means includes
an over-center spring means.

18. An oscillating sprinkler transmission as set forth
in Claim 17 wherein said over-center spring means includes
a cam and adjacent biasing follower means having slideably
engaging surfaces for biasing and maintaining said gear
5 cage in a selected one of alternately engageable positions
until the moment of disengagement and gear cage shifting
over center at which time its action then moves said gear
cage to bring the other of said driving gears into reversed
driving engagement.

19. An oscillating sprinkler transmission as set forth
in Claim 18 wherein one of said surfaces is contoured to
vary the effect of the biasing follower means on said cam.

20. An oscillating sprinkler transmission having an output gear, said output gear having an axis, a gear cage having a first drive gear and a second drive gear for alternate driving engagement with said output gear to oscillate it between a clockwise and a counter-clockwise direction, said gear cage having an idler gear in engagement with said first drive gear, said second drive gear and said idler gear being spaced apart, an input gear located between said second drive gear and said idler gear, said gear cage being mounted for pivotal movement, means for pivoting said gear cage in one direction to bring said second drive gear into engagement with said input gear and for pivoting said gear cage in the other direction to bring said idler gear into engagement with said input gear, said input gear driving said output gear in one direction through said second drive gear, said input gear driving said output gear in the other direction through said idler gear wherein the driving reaction force on the gear cage holds the gear cage in driving engagement with the input gear in both driving directions.

21. An oscillating sprinkler transmission as set forth in Claim 20, wherein said first and second drive gears both are in continuous engagement with said output gear.

22. An oscillating sprinkler having
an oscillating transmission, said oscillating trans-
mission having an output gear means thereon, a pivoted
gear cage having a first clockwise drive gear means and a
5 second counter-clockwise drive gear means for alternately
driving said output gear means in opposite directions,
said pivoted gear cage being pivotally mounted between two
positions so that in one position said first clockwise
drive gear means drives said output gear means in a clock-
10 wise direction and in a second position said second counter-
clockwise drive gear means drives said output gear means in
a counter-clockwise direction to oscillate it; a first
overcenter spring means for biasing said gear cage over-
center in either direction to drive said output gear means
15 in either direction; toggle means mounted for movement
relative to said gear cage between a cooperating first and
second limit means on said gear cage, said toggle means
including second overcenter spring means for biasing said
toggle means in one direction overcenter against said
20 first limit means and in another direction overcenter
against said second limit means; said first limit means,
when biased by said second overcenter spring means through
said toggle means, biasing said gear cage and its first
overcenter spring means overcenter for rotating said output
25 gear means in one direction; said second limit means, when
biased by said second overcenter spring means through said
toggle means, biasing said gear cage and its first overcenter

spring means overcenter for rotating said output gear means
in the other direction; actuating means on said toggle means;
30 an arc control to contact said actuating means to move said
toggle means in one direction where the second overcenter
spring means will bias said toggle means to its cooperating
limit means on said gear cage and then bias the gear cage
against the bias of said first overcenter spring means; when
35 the gear cage is moved overcenter by the second overcenter
spring means it will join the first overcenter spring means
and bias said gear cage towards driving engagement; first stop
means for limiting the rotational travel of said toggle means
prior to movement of the gear cage to drive the output gear
40 in the opposite direction; the first overcenter spring means
will then continue to carry the gear cage into engagement
for driving the output gear in the opposite direction changing
the direction of rotation of said output gear means whereby
said contact means rotatable with said output gear means
45 will contact said actuating means on said toggle means and
move said toggle means in the other direction where the
second overcenter spring means will bias said toggle means
to its other cooperating limit means on said gear cage and
then bias the gear cage against the bias of said first
50 overcenter spring means; when the gear cage is moved over-
center by the second overcenter spring means it will join
the first overcenter spring means and bias said gear cage
towards driving engagement; second stop means for limiting
the rotational travel of said toggle means prior to movement

55 of the gear cage to drive the output gear in the opposite direction; the first overcenter spring means will then continue to carry the gear cage into engagement for driving the output gear in the opposite direction.

23. A sprinkler oscillating transmission having an output gear, means for mounting said output gear for rotation about an axis, a gear cage with one drive gear for alternate driving engagement with one of two counter
5 rotating input shaft gears for driving engagement with said output gear to oscillate it, means pivotally mounting said gear cage for movement, means for alternately pivoting said gear cage in one direction to drivingly engage said first
10 input gear with said output gear and in the other direction to drivingly engage said second counter rotating input shaft gear with said output gear including spring means for biasing said gear cage in one direction or the other direction, said means for alternately pivoting said gear cage having a toggle device pivotally mounted with respect
15 to said gear cage for reversing the movement of said gear cage, said gear cage and toggle device being mounted for separate pivotal movement, said toggle device comprising a plate pivotally mounted around the axis of said output gear, said spring means biasing said gear cage in one direction or
20 the other direction through said plate, said spring means having fixed first spring seat means located radially inwardly of said plate, said plate having second spring seat means located radially outwardly on said plate, said spring means being located between said first spring seat means and
25 said second spring seat means for acting outwardly on said plate to bias it in one direction or the other direction.

24. An oscillating transmission as set forth in Claim 23 wherein said spring means is located in a cut-out portion of said plate.

25. A sprinkler oscillating transmission having an output gear, said output gear being mounted for rotation in either direction, a gear cage having a single shiftable connecting pinion gear for alternately driving said output gear to oscillate said output gear between a first and second angular position, means mounting said gear cage for movement between a first and second drivingly engaged position means for alternately moving said gear cage in one direction to said first drivingly engaged position to drivingly engage a first input shaft gear with said output gear to drive said output gear in a direction to its second angular position and in the other direction to said second drivingly engaged position to drivingly engage a second counter rotating input shaft gear with said output gear to drive said output gear in a direction to its first angular position, said means for alternately moving said gear cage including first biasing means for alternately biasing said gear cage in one direction or the other towards its first or second drivingly engaged position, said means for alternately moving said gear cage removing the bias of said first biasing means from said gear cage during the movement of said output gear to its first or second angular position, and second biasing means for directly biasing said gear cage in said one direction towards its first drivingly engaged position to maintain said gear cage biased in said one direction when said first biasing means for biasing has been removed to move said gear cage in said other direction at least until said first biasing means is biasing said gear cage in said other direction.

26. A combination as set forth in Claim 25 wherein
said second biasing means is also for directly biasing
said gear cage in said other direction towards its
first drivingly engaged position to maintain said gear
5 cage biased in said other direction when said first
biasing means for biasing has been removed to move said
gear cage in said one direction until said first biasing
means is biasing said gear cage in said one direction.

27. A combination as set forth in Claim 25
including a downward projection on said gear cage having
a surface on which said second biasing means acts.

28. An oscillating sprinkler unit, comprising:
a sprinkler head mounted for rotation about a first axis; a
drive motor; a reversible gear train for drivingly
connecting said drive motor to said sprinkler head for
5 driving said sprinkler head in alternate directions,
comprising a final drive gear connected to said sprinkler
head, shiftable drive means comprising a carrier and single
connecting drive gear for alternately engaging one of two
counter rotating gears with said final drive gear for
10 driving said sprinkler head in alternate directions;
shifting arm means pivotally mounted adjacent said carrier
and moveable between alternate shifting positions by
engagement with arc control contact means rotatable with
said final drive gear, and lost motion means for connecting
15 said shifting arm means with said carrier for shifting said
carrier between said alternately engageable positions upon
movement of said shifting arm means between said alternate
shifting positions; and cam means on said carrier slideably
engageable by adjacent biasing follower means for biasing
20 and maintaining said carrier in a selected one of said
alternately engageable positions until shifted there from by
said shifting arm means.

29. An oscillating sprinkler unit, comprising:
a housing having a generally cylindrical configuration with
a central axis, an inlet at a lower end for attachment to a
source of water and an outlet at an upper end; a sprinkler
5 head mounted on said upper end for rotation about said
central axis; a drive motor mounted in said housing for
driving said sprinkler head; a shiftable gear train
comprising terminal drive gear means connected to said
sprinkler head, shiftable means for alternatively shifting
10 said terminal drive gear means alternatively into engagement
with counter rotating internal gears for driving said
sprinkler head in alternate directions; said shiftable drive
means comprising counter rotating drive gears driven by said
drive motor rotation about an axis offset from said first
15 axis; a pivoting gear carrier mounted for pivotal movement
about an axis; to provide driving engagement of one or the
other of said counter rotating gears with said terminal gear
means; a shifting arm mounted for pivotal movement; lost
motion means disposed between said shifting arm and said
20 carrier for connecting said shifting arm to said gear
carrier for shifting said terminal drive gear means to
alternately engageable positions; first overcenter biasing
means for maintaining said shifting arm means in a selected
one of said alternately shifting positions; and overcenter
25 bias means applied on said pivoted gear carrier for biasing
and maintaining said gear carrier in a selected one of said
alternate engageable positions until said pivoted gear

carrier is shifted out of engagement and carried over its
bias means center by the shifting arm bias at which time the
30 pivot gear carrier bias means force biases said pivoted gear
carrier into driving engagement for rotating said terminal
drive gear in the reverse direction.